RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing

(1) General information:

A total of 8 DNA sequences and 8 amino acid sequences.

(2) Information for pPA-GBP plasmid DNA sequence and His_6-protein A-GBP fusion protein sequence (seq. ID No. 1):
(A) Length of plasmid- 5454 base pairs
(B) Length of fusion protein- 257 amino acids
(C) Number of sheets listing sequences- 4

(2) Information for pStreptavidin-GBP plasmid DNA sequence and His_6-streptavidin-GBP fusion protein sequence (Seq. ID No. 2):
(A) Length of plasmid- 5448 base pairs
(B) Length of fusion protein- 255 amino acids
(C) Number of sheets listing sequences and information- 4

(2) Information for pPA-GBP-PA plasmid DNA sequence and His_6-protein A-GBP-protein A fusion protein sequence (Seq. ID No. 3):
(A) Length of plasmid- 1182 base pairs
(B) Length of fusion protein- 393 amino acids
(C) Number of sheets listing sequences- 2

(2) Information for pstrept-GBP-streptavidin plasmid DNA sequence and His_6-streptavidin-GBP-streptavidin fusion protein sequence (Seq. ID No. 4):
(A) Length of plasmid- 966 base pairs
(B) Length of fusion protein- 322 amino acids
(C) Number of sheets listing sequences- 2

(2) Information for pPA-GBP-streptavidin plasmid DNA sequence and His6-protein A-GBP-streptavidin fusion protein sequence (Seq. ID No. 5):
(A) Length of plasmid- 1176 base pairs
(B) Length of fusion protein- 391 amino acids
(C) Number of sheets listing sequences- 2

(2) Information for pStreptavidin-GBP-PA plasmid DNA sequence and His_6-streptavidin-GBP-protein A fusion protein sequence (Seq. ID No. 6):
(A) Length of plasmid- 1176 base pairs
(B) Length of fusion protein- 391 amino acids
(C) Number of sheets listing sequences- 2

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing (continued)

(2) Information for pGBP-plasmid DNA sequence and His_6-GBP fusion protein sequence (Seq. ID No. 7):
(A) Length of plasmid- 393 base pairs
(B) Length of fusion protein- 130 amino acids
(C) Number of sheets listing sequences- 1

(2) Information for pGBP-GBP plasmid DNA sequence and His_6-GBP-GBP fusion protein sequence (Seq. ID. No. 8):
(A) Length of plasmid- 741 base pairs
(B) Length of fusion protein- 246 amino acids
(C) Number of sheets listing sequences- 2

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences I.D. No. 1

```
1   CTCGAGAAAT CATAAAAAAT TTATTTGCTT TGTGAGCGGA TAACAATTAT
 51   AATAGATTCA ATTGTGAGCG GATAACAATT TCACACAGAA TTCATTAAAG
101   AGGAGAAATT AACT ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA
                      Met Arg Gly Ser His His His His His His Gly

148   TCC GGT TCT GGT GCG CAA CAC GAT GAA GCC GTA GAC AAC AAA TTC
      Ser Gly Ser Gly Ala Gln His Asp Glu Ala Val Asp Asn Lys Phe

193   AAC AAA GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT
      Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro

238   AAC TTA AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA
      Asn Leu Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys

283   GAT GAC CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG
      Asp Asp Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys

328   CTA AAT GAT GCT CAG GCG CCG AAA GTA GAC AAC AAA TTC AAC AAA
      Leu Asn Asp Ala Gln Ala Pro Lys Val Asp Asn Lys Phe Asn Lys

373   GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA
      Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu

418   AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC
      Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp

463   CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT
      Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn

508   GAT GCT CAG GCG CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT AGT
      Asp Ala Gln Ala Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Ser

553   GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT
      Gly Asn Gly His Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr

598   ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC
      Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile

643   CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG
      Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln

688   AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC
      Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser

733   ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
      Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences (continued) I.D. No. 1

```
 778  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
      His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

 823  GGA AAA ATT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT
      Gly Lys Ile Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala

 868  CTG TCC CTC GAG GGT CCG TAA TAAGCTTAAT TAGCTGAGCT TGGACTCCTG
      Leu Ser Leu Glu Gly Pro ---

 919  TTGATAGATC CAGTAATGAC CTCAGAACTC CATCTGGATT TGTTCAGAAC
 969  GCTCGGTTGC CGCCGGGCGT TTTTTATTGG TGAGAATCCA AGCTAGCTTG
1019  GCGAGATTTT CAGGAGCTAA GGAAGCTAAA ATGGAGAAAA AAATCACTGG
1069  ATATACCACC GTTGATATAT CCCAATGGCA TCGTAAAGAA CATTTTGAGG
1119  CATTTCAGTC AGTTGCTCAA TGTACCTATA ACCAGACCGT TCAGCTGGAT
1169  ATTACGGCCT TTTTAAAGAC CGTAAAGAAA AATAAGCACA AGTTTTATCC
1219  GGCCTTTATT CACATTCTTG CCCGCCTGAT GAATGCTCAT CCGGAATTTC
1269  GTATGGCAAT GAAAGACGGT GAGCTGGTGA TATGGGATAG TGTTCACCCT
1319  TGTTACACCG TTTTCCATGA GCAAACTGAA ACGTTTTCAT CGCTCTGGAG
1369  TGAATACCAC GACGATTTCC GGCAGTTTCT ACACATATAT TCGCAAGATG
1419  TGGCGTGTTA CGGTGAAAAC CTGGCCTATT TCCCTAAAGG GTTTATTGAG
1469  AATATGTTTT TCGTCTCAGC CAATCCCTGG GTGAGTTTCA CCAGTTTTGA
1519  TTTAAACGTG GCCAATATGG ACAACTTCTT CGCCCCCGTT TTCACCATGG
1569  GCAAATATTA TACGCAAGGC GACAAGGTGC TGATGCCGCT GGCGATTCAG
1619  GTTCATCATG CCGTTTGTGA TGGCTTCCAT GTCGGCAGAA TGCTTAATGA
1669  ATTACAACAG TACTGCGATG AGTGGCAGGG CGGGGCGTAA TTTTTTTAAG
1719  GCAGTTATTG GTGCCCTTAA ACGCCTGGGG TAATGACTCT CTAGCTTGAG
1769  GCATCAAATA AAACGAAAGG CTCAGTCGAA AGACTGGGCC TTTCGTTTTA
1819  TCTGTTGTTT GTCGGTGAAC GCTCTCCTGA GTAGGACAAA TCCGCCCTCT
1869  AGATTACGTG CAGTCGATGA TAAGCTGTCA AACATGAGAA TTGTGCCTAA
1919  TGAGTGAGCT AACTTACATT AATTGCGTTG CGCTCACTGC CCGCTTTCCA
1969  GTCGGGAAAC CTGTCGTGCC AGCTGCATTA ATGAATCGGC CAACGCGCGG
2019  GGAGAGGCGG TTTGCGTATT GGGCGCCAGG GTGGTTTTTC TTTTCACCAG
2069  TGAGACGGGC AACAGCTGAT TGCCCTTCAC CGCCTGGCCC TGAGAGAGTT
2119  GCAGCAAGCG GTCCACGCTG GTTTGCCCCA GCAGGCGAAA ATCCTGTTTG
2169  ATGGTGGTTA ACGGCGGGAT ATAACATGAG CTGTCTTCGG TATCGTCGTA
2219  TCCCACTACC GAGATATCCG CACCAACGCG CAGCCCGGAC TCGGTAATGG
2269  CGCGCATTGC GCCCAGCGCC ATCTGATCGT TGGCAACCAG CATCGCAGTG
2319  GGAACGATGC CCTCATTCAG CATTTGCATG GTTTGTTGAA AACCGGACAT
2369  GGCACTCCAG TCGCCTTCCC GTTCCGCTAT CGGCTGAATT TGATTGCGAG
2419  TGAGATATTT ATGCCAGCCA GCCAGACGCA GACGCGCCGA GACAGAACTT
2469  AATGGGCCCG CTAACAGCGC GATTTGCTGG TGACCCAATG CGACCAGATG
2519  CTCCACGCCC AGTCGCGTAC CGTCTTCATG GGAGAAAATA ATACTGTTGA
2569  TGGGTGTCTG GTCAGAGACA TCAAGAAATA ACGCCGGAAC ATTAGTGCAG
2619  GCAGCTTCCA CAGCAATGGC ATCCTGGTCA TCCAGCGGAT AGTTAATGAT
2669  CAGCCCACTG ACGCGTTGCG CGAGAAGATT GTGCACCGCC GCTTTACAGG
2719  CTTCGACGCC GCTTCGTTCT ACCATCGACA CCACCACGCT GGCACCCAGT
2769  TGATCGGCGC GAGATTTAAT CGCCGCGACA ATTTGCGACG GCGCGTGCAG
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences (continued) I.D. No. 1

```
2819  GGCCAGACTG GAGGTGGCAA CGCCAATCAG CAACGACTGT TTGCCCGCCA
2869  GTTGTTGTGC CACGCGGTTG GGAATGTAAT TCAGCTCCGC CATCGCCGCT
2919  TCCACTTTTT CCCGCGTTTT CGCAGAAACG TGGCTGGCCT GGTTCACCAC
2969  GCGGGAAACG GTCTGATAAG AGACACCGGC ATACTCTGCG ACATCGTATA
3019  ACGTTACTGG TTTCACATTC ACCACCCTGA ATTGACTCTC TTCCGGGCGC
3069  TATCATGCCA TACCGCGAAA GGTTTTGCAC CATTCGATGG TGTCGGAATT
3119  TCGGGCAGCG TTGGGTCCTG GCCACGGGTG CGCATGATCT AGAGCTGCCT
3169  CGCGCGTTTC GGTGATGACG GTGAAAACCT CTGACACATG CAGCTCCCGG
3219  AGACGGTCAC AGCTTGTCTG TAAGCGGATG CCGGGAGCAG ACAAGCCCGT
3269  CAGGGCGCGT CAGCGGGTGT TGGCGGGTGT CGGGGCGCAG CCATGACCCA
3319  GTCACGTAGC GATAGCGGAG TGTATACTGG CTTAACTATG CGGCATCAGA
3369  GCAGATTGTA CTGAGAGTGC ACCATATGCG GTGTGAAATA CCGCACAGAT
3419  GCGTAAGGAG AAAATACCGC ATCAGGCGCT CTTCCGCTTC CTCGCTCACT
3469  GACTCGCTGC GCTCGGTCGT TCGGCTGCGG CGAGCGGTAT CAGCTCACTC
3519  AAAGGCGGTA ATACGGTTAT CCACAGAATC AGGGGATAAC GCAGGAAAGA
3569  ACATGTGAGC AAAAGGCCAG CAAAAGGCCA GGAACCGTAA AAAGGCCGCG
3619  TTGCTGGCGT TTTTCCATAG GCTCCGCCCC CCTGACGAGC ATCACAAAAA
3669  TCGACGCTCA AGTCAGAGGT GGCGAAACCC GACAGGACTA TAAAGATACC
3719  AGGCGTTTCC CCCTGGAAGC TCCCTCGTGC GCTCTCCTGT TCCGACCCTG
3769  CCGCTTACCG GATACCTGTC CGCCTTTCTC CCTTCGGGAA GCGTGGCGCT
3819  TTCTCATAGC TCACGCTGTA GGTATCTCAG TTCGGTGTAG GTCGTTCGCT
3869  CCAAGCTGGG CTGTGTGCAC GAACCCCCCG TTCAGCCCGA CCGCTGCGCC
3919  TTATCCGGTA ACTATCGTCT TGAGTCCAAC CCGGTAAGAC ACGACTTATC
3969  GCCACTGGCA GCAGCCACTG GTAACAGGAT TAGCAGAGCG AGGTATGTAG
4019  GCGGTGCTAC AGAGTTCTTG AAGTGGTGGC CTAACTACGG CTACACTAGA
4069  AGGACAGTAT TTGGTATCTG CGCTCTGCTG AAGCCAGTTA CCTTCGGAAA
4119  AAGAGTTGGT AGCTCTTGAT CCGGCAAACA AACCACCGCT GGTAGCGGTG
4169  GTTTTTTTGT TTGCAAGCAG CAGATTACGC GCAGAAAAAA AGGATCTCAA
4219  GAAGATCCTT TGATCTTTTC TACGGGGTCT GACGCTCAGT GGAACGAAAA
4269  CTCACGTTAA GGGATTTTGG TCATGAGATT ATCAAAAAGG ATCTTCACCT
4319  AGATCCTTTT AAATTAAAAA TGAAGTTTTA AATCAATCTA AAGTATATAT
4369  GAGTAAACTT GGTCTGACAG TTACCAATGC TTAATCAGTG AGGCACCTAT
4419  CTCAGCGATC TGTCTATTTC GTTCATCCAT AGTTGCCTGA CTCCCCGTCG
4469  TGTAGATAAC TACGATACGG GAGGGCTTAC CATCTGGCCC CAGTGCTGCA
4519  ATGATACCGC GAGACCCACG CTCACCGGCT CCAGATTTAT CAGCAATAAA
4569  CCAGCCAGCC GGAAGGGCCG AGCGCAGAAG TGGTCCTGCA ACTTTATCCG
4619  CCTCCATCCA GTCTATTAAT TGTTGCCGGG AAGCTAGAGT AAGTAGTTCG
4669  CCAGTTAATA GTTTGCGCAA CGTTGTTGCC ATTGCTACAG GCATCGTGGT
4719  GTCACGCTCG TCGTTTGGTA TGGCTTCATT CAGCTCCGGT TCCCAACGAT
4769  CAAGGCGAGT TACATGATCC CCCATGTTGT GCAAAAAAGC GGTTAGCTCC
4819  TTCGGTCCTC CGATCGTTGT CAGAAGTAAG TTGGCCGCAG TGTTATCACT
4869  CATGGTTATG GCAGCACTGC ATAATTCTCT TACTGTCATG CCATCCGTAA
4919  GATGCTTTTC TGTGACTGGT GAGTACTCAA CCAAGTCATT CTGAGAATAG
4969  TGTATGCGGC GACCGAGTTG CTCTTGCCCG GCGTCAATAC GGGATAATAC
5019  CGCGCCACAT AGCAGAACTT TAAAAGTGCT CATCATTGGA AAACGTTCTT
5069  CGGGGCGAAA ACTCTCAAGG ATCTTACCGC TGTTGAGATC CAGTTCGATG
5119  TAACCCACTC GTGCACCCAA CTGATCTTCA GCATCTTTTA CTTTCACCAG
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences (continued) I.D. No. 1

```
5169  CGTTTCTGGG TGAGCAAAAA CAGGAAGGCA AAATGCCGCA AAAAAGGGAA
5219  TAAGGGCGAC ACGGAAATGT TGAATACTCA TACTCTTCCT TTTTCAATAT
5269  TATTGAAGCA TTTATCAGGG TTATTGTCTC ATGAGCGGAT ACATATTTGA
5319  ATGTATTTAG AAAAATAAAC AAATAGGGGT TCCGCGCACA TTTCCCCGAA
5369  AAGTGCCACC TGACGTCTAA GAAACCATTA TTATCATGAC ATTAACCTAT
5419  AAAAATAGGC GTATCACGAG GCCCTTTCGT CTTCAC
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DNA sequence of the expression plasmid pPA-GBP. The amino acid sequence of the His_6-Protein A-GBP fusion protein is shown below the corresponding coding triplets. The amino acids corresponding to the His-tag and the linker regions are italicized and the Asn-Gly hydroxylamine cleavage site is bold-faced. The basic expression vector is pQE-80L, purchased from Qiagen. The coding sequence for the partial E domain and the two IgG-binding, synthetic Z domains of staphylococcal Protein A (Nilsson, *et al., Protein Eng* 1:107-113, 1987) corresponding to nucleotides 160-528 is derived from the plasmid pEZZ18, purchased from Amersham. The coding sequence for GBP corresponding to nucleotides 565-858 is derived from plasmid pSB3053 obtained from Dr. S. Brown (Brown, *Nat Biotechnol* 15:269-272, 1997).

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStreptavidin-GBP plasmid-DNA and amino acid sequences I.D. No. 2

```
1   CTCGAGAAAT CATAAAAAAT TTATTTGCTT TGTGAGCGGA TAACAATTAT
 51   AATAGATTCA ATTGTGAGCG GATAACAATT TCACACAGAA TTCATTAAAG
101   AGGAGAAATT AACT ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC
                      Met Arg Gly Ser His His His His His His Gly Ser

151   GGT TCT GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC ACC TGG TAC
      Gly Ser Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly Thr Trp Tyr

199   AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT GCT GAC GGT GCT
      Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly Ala Asp Gly Ala

247   CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC GCT GAA TCT AGA TAC
      Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn Ala Glu Ser Arg Tyr

295   GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG GCT ACC GAC GGT TCC GGA
      Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro Ala Thr Asp Gly Ser Gly

343   ACC GCT CTG GGT TGG ACC GTT GCT TGG AAA AAC AAC TAC CGT AAC GCT
      Thr Ala Leu Gly Trp Thr Val Ala Trp Lys Asn Asn Tyr Arg Asn Ala

391   CAC TCC GCT ACC ACC TGG TCT GGC CAG TAC GTT GGT GGT GCT GAA GCT
      His Ser Ala Thr Thr Trp Ser Gly Gln Tyr Val Gly Gly Ala Glu Ala

439   CGT ATC AAC ACC CAG TGG TTG TTG ACC TCC GGC ACC ACC GAA GCT AAC
      Arg Ile Asn Thr Gln Trp Leu Leu Thr Ser Gly Thr Thr Glu Ala Asn

487   GCG TGG AAA TCC ACC CTG GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG
      Ala Trp Lys Ser Thr Leu Val Gly His Asp Thr Phe Thr Lys Val Ser

535   AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG GCA ACC
      Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln Ala Thr

583   AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG
      Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly

631   ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC
      Thr Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile

679   CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC
      Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser

727   ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
      Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

775   GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA
      Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStreptavidin-GBP plasmid-DNA & amino acid sequences (continued) I.D. No. 2

```
823  ATT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC
       Ile Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu

 871  GAG GGT CCG TAA TAAGCTTAAT TAGCTGAGCT TGGACTCCTG TTGATAGATC
       Glu Gly Pro ---

 923  CAGTAATGAC CTCAGAACTC CATCTGGATT TGTTCAGAAC GCTCGGTTGC
 973  CGCCGGGCGT TTTTTATTGG TGAGAATCCA AGCTAGCTTG GCGAGATTTT
1023  CAGGAGCTAA GGAAGCTAAA ATGGAGAAAA AAATCACTGG ATATACCACC
1073  GTTGATATAT CCCAATGGCA TCGTAAAGAA CATTTTGAGG CATTTCAGTC
1123  AGTTGCTCAA TGTACCTATA ACCAGACCGT TCAGCTGGAT ATTACGGCCT
1173  TTTTAAAGAC CGTAAAGAAA AATAAGCACA AGTTTTATCC GGCCTTTATT
1223  CACATTCTTG CCCGCCTGAT GAATGCTCAT CCGGAATTTC GTATGGCAAT
1273  GAAAGACGGT GAGCTGGTGA TATGGGATAG TGTTCACCCT TGTTACACCG
1323  TTTTCCATGA GCAAACTGAA ACGTTTTCAT CGCTCTGGAG TGAATACCAC
1373  GACGATTTCC GGCAGTTTCT ACACATATAT TCGCAAGATG TGGCGTGTTA
1423  CGGTGAAAAC CTGGCCTATT TCCCTAAAGG GTTTATTGAG AATATGTTTT
1473  TCGTCTCAGC CAATCCCTGG GTGAGTTTCA CCAGTTTTGA TTTAAACGTG
1523  GCCAATATGG ACAACTTCTT CGCCCCCGTT TTCACCATGG GCAAATATTA
1573  TACGCAAGGC GACAAGGTGC TGATGCCGCT GGCGATTCAG GTTCATCATG
1623  CCGTTTGTGA TGGCTTCCAT GTCGGCAGAA TGCTTAATGA ATTACAACAG
1673  TACTGCGATG AGTGGCAGGG CGGGGCGTAA TTTTTTTAAG GCAGTTATTG
1723  GTGCCCTTAA ACGCCTGGGG TAATGACTCT CTAGCTTGAG GCATCAAATA
1773  AAACGAAAGG CTCAGTCGAA AGACTGGGCC TTTCGTTTTA TCTGTTGTTT
1823  GTCGGTGAAC GCTCTCCTGA GTAGGACAAA TCCGCCCTCT AGATTACGTG
1873  CAGTCGATGA TAAGCTGTCA AACATGAGAA TTGTGCCTAA TGAGTGAGCT
1923  AACTTACATT AATTGCGTTG CGCTCACTGC CCGCTTTCCA GTCGGGAAAC
1973  CTGTCGTGCC AGCTGCATTA ATGAATCGGC CAACGCGCGG GGAGAGGCGG
2023  TTTGCGTATT GGGCGCCAGG GTGGTTTTTC TTTTCACCAG TGAGACGGGC
2073  AACAGCTGAT TGCCCTTCAC CGCCTGGCCC TGAGAGAGTT GCAGCAAGCG
2123  GTCCACGCTG GTTTGCCCCA GCAGGCGAAA ATCCTGTTTG ATGGTGGTTA
2173  ACGGCGGGAT ATAACATGAG CTGTCTTCGG TATCGTCGTA TCCCACTACC
2223  GAGATATCCG CACCAACGCG CAGCCCGGAC TCGGTAATGG CGCGCATTGC
2273  GCCCAGCGCC ATCTGATCGT TGGCAACCAG CATCGCAGTG GGAACGATGC
2323  CCTCATTCAG CATTTGCATG GTTTGTTGAA AACCGGACAT GGCACTCCAG
2373  TCGCCTTCCC GTTCCGCTAT CGGCTGAATT TGATTGCGAG TGAGATATTT
2423  ATGCCAGCCA GCCAGACGCA GACGCGCCGA GACAGAACTT AATGGGCCCG
2473  CTAACAGCGC GATTTGCTGG TGACCCAATG CGACCAGATG CTCCACGCCC
2523  AGTCGCGTAC CGTCTTCATG GGAGAAAATA ATACTGTTGA TGGGTGTCTG
2573  GTCAGAGACA TCAAGAAATA ACGCCGGAAC ATTAGTGCAG GCAGCTTCCA
2623  CAGCAATGGC ATCCTGGTCA TCCAGCGGAT AGTTAATGAT CAGCCCACTG
2673  ACGCGTTGCG CGAGAAGATT GTGCACCGCC GCTTTACAGG CTTCGACGCC
2723  GCTTCGTTCT ACCATCGACA CCACCACGCT GGCACCCAGT TGATCGGCGC
2773  GAGATTTAAT CGCCGCGACA ATTTGCGACG GCGCGTGCAG GGCCAGACTG
2823  GAGGTGGCAA CGCCAATCAG CAACGACTGT TTGCCCGCCA GTTGTTGTGC
2873  CACGCGGTTG GGAATGTAAT TCAGCTCCGC CATCGCCGCT TCCACTTTTT
2923  CCCGCGTTTT CGCAGAAACG TGGCTGGCCT GGTTCACCAC GCGGGAAACG
2973  GTCTGATAAG AGACACCGGC ATACTCTGCG ACATCGTATA ACGTTACTGG
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStreptavidin-GBP plasmid-DNA & amino acid sequences (continued)

I.D. No. 2

```
3023  TTTCACATTC ACCACCCTGA ATTGACTCTC TTCCGGGCGC TATCATGCCA
3073  TACCGCGAAA GGTTTTGCAC CATTCGATGG TGTCGGAATT TCGGGCAGCG
3123  TTGGGTCCTG GCCACGGGTG CGCATGATCT AGAGCTGCCT CGCGCGTTTC
3173  GGTGATGACG GTGAAAACCT CTGACACATG CAGCTCCCGG AGACGGTCAC
3223  AGCTTGTCTG TAAGCGGATG CCGGGAGCAG ACAAGCCCGT CAGGGCGCGT
3273  CAGCGGGTGT TGGCGGGTGT CGGGGCGCAG CCATGACCCA GTCACGTAGC
3323  GATAGCGGAG TGTATACTGG CTTAACTATG CGGCATCAGA GCAGATTGTA
3373  CTGAGAGTGC ACCATATGCG GTGTGAAATA CCGCACAGAT GCGTAAGGAG
3423  AAAATACCGC ATCAGGCGCT CTTCCGCTTC CTCGCTCACT GACTCGCTGC
3473  GCTCGGTCGT TCGGCTGCGG CGAGCGGTAT CAGCTCACTC AAAGGCGGTA
3523  ATACGGTTAT CCACAGAATC AGGGGATAAC GCAGGAAAGA ACATGTGAGC
3573  AAAAGGCCAG CAAAAGGCCA GGAACCGTAA AAAGGCCGCG TTGCTGGCGT
3623  TTTTCCATAG GCTCCGCCCC CCTGACGAGC ATCACAAAAA TCGACGCTCA
3673  AGTCAGAGGT GGCGAAACCC GACAGGACTA TAAAGATACC AGGCGTTTCC
3723  CCCTGGAAGC TCCCTCGTGC GCTCTCCTGT TCCGACCCTG CCGCTTACCG
3773  GATACCTGTC CGCCTTTCTC CCTTCGGGAA GCGTGGCGCT TTCTCATAGC
3823  TCACGCTGTA GGTATCTCAG TTCGGTGTAG GTCGTTCGCT CCAAGCTGGG
3873  CTGTGTGCAC GAACCCCCCG TTCAGCCCGA CCGCTGCGCC TTATCCGGTA
3923  ACTATCGTCT TGAGTCCAAC CCGGTAAGAC ACGACTTATC GCCACTGGCA
3973  GCAGCCACTG GTAACAGGAT TAGCAGAGCG AGGTATGTAG GCGGTGCTAC
4023  AGAGTTCTTG AAGTGGTGGC CTAACTACGG CTACACTAGA AGGACAGTAT
4073  TTGGTATCTG CGCTCTGCTG AAGCCAGTTA CCTTCGGAAA AAGAGTTGGT
4123  AGCTCTTGAT CCGGCAAACA AACCACCGCT GGTAGCGGTG GTTTTTTTGT
4173  TTGCAAGCAG CAGATTACGC GCAGAAAAAA AGGATCTCAA GAAGATCCTT
4223  TGATCTTTTC TACGGGGTCT GACGCTCAGT GGAACGAAAA CTCACGTTAA
4273  GGGATTTTGG TCATGAGATT ATCAAAAAGG ATCTTCACCT AGATCCTTTT
4323  AAATTAAAAA TGAAGTTTTA AATCAATCTA AAGTATATAT GAGTAAACTT
4373  GGTCTGACAG TTACCAATGC TTAATCAGTG AGGCACCTAT CTCAGCGATC
4423  TGTCTATTTC GTTCATCCAT AGTTGCCTGA CTCCCCGTCG TGTAGATAAC
4473  TACGATACGG GAGGGCTTAC CATCTGGCCC CAGTGCTGCA ATGATACCGC
4523  GAGACCCACG CTCACCGGCT CCAGATTTAT CAGCAATAAA CCAGCCAGCC
4573  GGAAGGGCCG AGCGCAGAAG TGGTCCTGCA ACTTTATCCG CCTCCATCCA
4623  GTCTATTAAT TGTTGCCGGG AAGCTAGAGT AAGTAGTTCG CCAGTTAATA
4673  GTTTGCGCAA CGTTGTTGCC ATTGCTACAG GCATCGTGGT GTCACGCTCG
4723  TCGTTTGGTA TGGCTTCATT CAGCTCCGGT TCCCAACGAT CAAGGCGAGT
4773  TACATGATCC CCCATGTTGT GCAAAAAAGC GGTTAGCTCC TTCGGTCCTC
4823  CGATCGTTGT CAGAAGTAAG TTGGCCGCAG TGTTATCACT CATGGTTATG
4873  GCAGCACTGC ATAATTCTCT TACTGTCATG CCATCCGTAA GATGCTTTTC
4923  TGTGACTGGT GAGTACTCAA CCAAGTCATT CTGAGAATAG TGTATGCGGC
4973  GACCGAGTTG CTCTTGCCCG GCGTCAATAC GGGATAATAC CGCGCCACAT
5023  AGCAGAACTT TAAAAGTGCT CATCATTGGA AAACGTTCTT CGGGGCGAAA
5073  ACTCTCAAGG ATCTTACCGC TGTTGAGATC CAGTTCGATG TAACCCACTC
5123  GTGCACCCAA CTGATCTTCA GCATCTTTTA CTTTCACCAG CGTTTCTGGG
5173  TGAGCAAAAA CAGGAAGGCA AAATGCCGCA AAAAAGGGAA TAAGGGCGAC
5223  ACGGAAATGT TGAATACTCA TACTCTTCCT TTTTCAATAT TATTGAAGCA
5273  TTTATCAGGG TTATTGTCTC ATGAGCGGAT ACATATTTGA ATGTATTTAG
5323  AAAAATAAAC AAATAGGGGT TCCGCGCACA TTTCCCCGAA AAGTGCCACC
5373  TGACGTCTAA GAAACCATTA TTATCATGAC ATTAACCTAT AAAAATAGGC
5423  GTATCACGAG GCCCTTTCGT CTTCAC
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStreptavidin-GBP plasmid-DNA & amino acid sequences (continued)

I.D. No. 2

DNA sequence of the expression plasmid pStreptavidin-GBP. The amino acid sequence of the His_6-Streptavidin-GBP fusion protein is shown below the corresponding coding triplets. The amino acids corresponding to the His-tag and the linker regions are italicized and the Asn-Gly hydroxylamine cleavage site is bold-faced. The basic expression vector is pQE-80L purchased from Qiagen. The coding sequence for core streptavidin residues 13-133 of the mature polypeptide (Sano, *et al., J Biol Chem* 270:28204-28209, 1995) corresponding to nucleotides 169-531 is derived from a plasmid obtained from Dr. P. Stayton (Chilkoti, *et al., Proc Natl Acad Sci U S A* 92:1754-1758, 1995). The coding sequence for GBP corresponding to nucleotides 559-852 is derived from plasmid pSB3053 obtained from Dr. S. Brown (Brown, *Nat. Biotechnol.* 15:269-272, 1997).

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. I.D. No. 3

```
115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT GGT
      Met Arg Gly Ser His His His His His His Gly Ser Gly Ser Gly

 160  GCG CAA CAC GAT GAA GCC GTA GAC AAC AAA TTC AAC AAA GAA CAA
      Ala Gln His Asp Glu Ala Val Asp Asn Lys Phe Asn Lys Glu Gln

 205  CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA
      Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu

 250  GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC
      Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser

 295  CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT
      Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala

 340  CAG GCG CCG AAA GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC
      Gln Ala Pro Lys Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn

 385  GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA
      Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln

 430  CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA AGC
      Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser

 475  GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT CAG GCG
      Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala

 520  CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT AGT GGC AAT GGT CAT
      Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Ser Gly Asn Gly His

 565  ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
      Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

 610  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
      His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

 655  GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA
      Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly

 700  AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA
      Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys

 745  ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
      Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

 790  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
      Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only. I.D. No. 3

```
835  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC GAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu Glu

 880  GGT GGC GGA TCC GGT TCT GGT GCG CAA CAC GAT GAA GCC GTA GAC
       Gly Gly Gly Ser Gly Ser Gly Ala Gln His Asp Glu Ala Val Asp

 925  AAC AAA TTC AAC AAA GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA
       Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu

 970  CAT TTA CCT AAC TTA AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA
       His Leu Pro Asn Leu Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln

1015  AGT TTA AAA GAT GAC CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA
       Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu

1060  GCT AAA AAG CTA AAT GAT GCT CAG GCG CCG AAA GTA GAC AAC AAA
       Ala Lys Lys Leu Asn Asp Ala Gln Ala Pro Lys Val Asp Asn Lys

1105  TTC AAC AAA GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA
       Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His Leu

1150  CCT AAC TTA AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA
       Pro Asn Leu Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu

1195  AAA GAT GAC CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA
       Lys Asp Asp Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys

1240  AAG CTA AAT GAT GCT CAG GCG CCG AAA GTA GAC GCG AAT TCG AGC
       Lys Leu Asn Asp Ala Gln Ala Pro Lys Val Asp Ala Asn Ser Ser

1285  TCT GGT GGC TAA
       Ser Gly Gly ---
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- Strept-GBP-Streptavidin plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pStreptavidin-GBP. I.D. No 4

```
115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT
       Met Arg Gly Ser His His His His His His Gly Ser Gly Ser

 157  GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC ACC TGG TAC
       Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly Thr Trp Tyr

 199  AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT GCT GAC
       Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly Ala Asp

 241  GGT GCT CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC GCT
       Gly Ala Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn Ala

 283  GAA TCT AGA TAC GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG
       Glu Ser Arg Tyr Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro

 325  GCT ACC GAC GGT TCC GGA ACC GCT CTG GGT TGG ACC GTT GCT
       Ala Thr Asp Gly Ser Gly Thr Ala Leu Gly Trp Thr Val Ala

 367  TGG AAA AAC AAC TAC CGT AAC GCT CAC TCC GCT ACC ACC TGG
       Trp Lys Asn Asn Tyr Arg Asn Ala His Ser Ala Thr Thr Trp

 409  TCT GGC CAG TAC GTT GGT GGT GCT GAA GCT CGT ATC AAC ACC
       Ser Gly Gln Tyr Val Gly Gly Ala Glu Ala Arg Ile Asn Thr

 451  CAG TGG TTG TTG ACC TCC GGC ACC ACC GAA GCT AAC GCG TGG
       Gln Trp Leu Leu Thr Ser Gly Thr Thr Glu Ala Asn Ala Trp

 493  AAA TCC ACC CTG GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG
       Lys Ser Thr Leu Val Gly His Asp Thr Phe Thr Lys Val Ser

 535  AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG
       Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln

 577  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

 619  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

 661  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

 703  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStrept-GBP-Strept plasmid- DNA and amino acid sequences of fusion protein only (continued). I.D. No. 4

```
745  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
      Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

787  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
      Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln

829  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC
      Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu

871  GAG GGA TCT GGT TCT GGT GGC CAT ATG GCT GAA GCT GGT ATC
      Glu Gly Ser Gly Ser Gly Gly His Met Ala Glu Ala Gly Ile

913  ACC GGC ACC TGG TAC AAC CAG CTG GGA TCC ACC TTC ATC GTT
      Thr Gly Thr Trp Tyr Asn Gln Leu Gly Ser Thr Phe Ile Val

955  ACC GCT GGT GCT GAC GGT GCT CTG ACC GGT ACC TAC GAA TCC
      Thr Ala Gly Ala Asp Gly Ala Leu Thr Gly Thr Tyr Glu Ser

997  GCT GTT GGT AAC GCT GAA TCT AGA TAC GTT CTG ACC GGT CGT
      Ala Val Gly Asn Ala Glu Ser Arg Tyr Val Leu Thr Gly Arg

1039 TAC GAC TCC GCT CCG GCT ACC GAC GGT TCC GGA ACC GCT CTG
      Tyr Asp Ser Ala Pro Ala Thr Asp Gly Ser Gly Thr Ala Leu
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP-Streptavidin plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. I.D. No. 5

```
115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT GGT
       Met Arg Gly Ser His His His His His His Gly Ser Gly Ser Gly

160  GCG CAA CAC GAT GAA GCC GTA GAC AAC AAA TTC AAC AAA GAA CAA
       Ala Gln His Asp Glu Ala Val Asp Asn Lys Phe Asn Lys Glu Gln

205  CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA
       Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu

250  GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC
       Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser

295  CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT
       Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala

340  CAG GCG CCG AAA GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC
       Gln Ala Pro Lys Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn

385  GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA
       Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln

430  CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA AGC
       Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser

475  GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT CAG GCG
       Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala

520  CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT AGT GGC AAT GGT CAT
       Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Ser Gly Asn Gly His

565  ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
       Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

610  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
       His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

655  GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA
       Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly

700  AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA
       Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys

745  ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
       Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

790  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
       Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP-Streptavidin plasmid- DNA and amino acid sequences of fusion protein only (continued). I.D. No. 5

```
 835  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC GAG
      Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu Glu

 880  GGA TCT GGT TCT GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC
      Gly Ser Gly Ser Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly

 925  ACC TGG TAC AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT
      Thr Trp Tyr Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly

 970  GCT GAC GGT GCT CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC
      Ala Asp Gly Ala Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn

1015  GCT GAA TCT AGA TAC GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG
      Ala Glu Ser Arg Tyr Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro

1060  GCT ACC GAC GGT TCC GGA ACC GCT CTG GGT TGG ACC GTT GCT TGG
      Ala Thr Asp Gly Ser Gly Thr Ala Leu Gly Trp Thr Val Ala Trp

1105  AAA AAC AAC TAC CGT AAC GCT CAC TCC GCT ACC ACC TGG TCT GGC
      Lys Asn Asn Tyr Arg Asn Ala His Ser Ala Thr Thr Trp Ser Gly

1150  CAG TAC GTT GGT GGT GCT GAA GCT CGT ATC AAC ACC CAG TGG TTG
      Gln Tyr Val Gly Gly Ala Glu Ala Arg Ile Asn Thr Gln Trp Leu

1195  TTG ACC TCC GGC ACC ACC GAA GCT AAC GCG TGG AAA TCC ACC CTG
      Leu Thr Ser Gly Thr Thr Glu Ala Asn Ala Trp Lys Ser Thr Leu

1240  GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG AGC TCA AGC TTA ATT
      Val Gly His Asp Thr Phe Thr Lys Val Ser Ser Ser Ser Leu Ile

1285  AGC TGA
      Ser ---
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- Streptavidin-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. I.D. No. 6

```
115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT
     Met Arg Gly Ser His His His His His His Gly Ser Gly Ser

157  GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC ACC TGG TAC
     Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly Thr Trp Tyr

199  AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT GCT GAC
     Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly Ala Asp

241  GGT GCT CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC GCT
     Gly Ala Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn Ala

283  GAA TCT AGA TAC GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG
     Glu Ser Arg Tyr Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro

325  GCT ACC GAC GGT TCC GGA ACC GCT CTG GGT TGG ACC GTT GCT
     Ala Thr Asp Gly Ser Gly Thr Ala Leu Gly Trp Thr Val Ala

367  TGG AAA AAC AAC TAC CGT AAC GCT CAC TCC GCT ACC ACC TGG
     Trp Lys Asn Asn Tyr Arg Asn Ala His Ser Ala Thr Thr Trp

409  TCT GGC CAG TAC GTT GGT GGT GCT GAA GCT CGT ATC AAC ACC
     Ser Gly Gln Tyr Val Gly Gly Ala Glu Ala Arg Ile Asn Thr

451  CAG TGG TTG TTG ACC TCC GGC ACC ACC GAA GCT AAC GCG TGG
     Gln Trp Leu Leu Thr Ser Gly Thr Thr Glu Ala Asn Ala Trp

493  AAA TCC ACC CTG GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG
     Lys Ser Thr Leu Val Gly His Asp Thr Phe Thr Lys Val Ser

535  AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG
     Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln

577  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
     Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

619  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
     Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

661  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
     Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

703  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
     Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- Streptavidin-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only (continued). I.D. No. 6

```
745  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

787  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln

829  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC
       Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu

871  GAG GGT GGC GGA TCC GGT TCT GGT GCG CAA CAC GAT GAA GCC
       Glu Gly Gly Gly Ser Gly Ser Gly Ala Gln His Asp Glu Ala

913  GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC GCG TTC TAT
       Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr

955  GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA CGA AAC
       Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln Arg Asn

997  GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA AGC GCT
       Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala

1039 AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT CAG GCG
       Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala

1081 CCG AAA GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC GCG
       Pro Lys Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala

1123 TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA
       Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln

1165 CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA
       Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln

1207 AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT
       Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala

1249 CAG GCG CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT GGC TAA
       Gln Ala Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Gly ---
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pGBP plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. I.D. No. 7

```
115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGA GGT GGG AGC
     Met Arg Gly Ser His His His His His His Gly Ser Gly Gly Gly Ser

163  TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG GCA ACC AGC
     Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln Ala Thr Ser

211  GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT
     Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr

259  ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG
     Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln

307  AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

355  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly

403  AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT
     Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile

451  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC GAG
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu Glu

499  GGT CCG TAA
     Gly Pro ---
```

RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pGBP-GBP plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. I.D. No. 8

```
115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGA GGT
     Met Arg Gly Ser His His His His His His Gly Ser Gly Gly

157  GGG AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT
     Gly Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr

199  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

241  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

283  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

325  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

367  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

409  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile

451  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC
     Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser

493  CTC GAG GGT GGT GGA AGC TCT GGT AGT GGC AAT GGT CAT ATG
     Leu Glu Gly Gly Gly Ser Ser Gly Ser Gly Asn Gly His Met

535  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

577  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

619  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

661  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

703  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

745  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met
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RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY BINDING TO GOLD AND APPLICATIONS THEREOF

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pGBP-GBP plasmid- DNA and amino acid sequences of fusion protein only (continued). I.D. No. 8

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787  CAT GGA AAA ATT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
     His Gly Lys Ile Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

829  CAT GCT CTG TCC CTC GAG GGT CCG TAA
     His Ala Leu Ser Leu Glu Gly Pro ---
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